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A REVIEW OF THE JAPANESE FISHES OF THE FAMILY OF AGONIDÆ.

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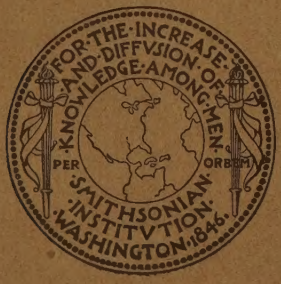
DAVID STARR JORDAN
AND
EDWIN CHAPIN STARKS,
Of Stanford University.

From the Proceedings of the United States National Museum, Vol. XXVII, pages 575-599.

[No. 1365.]



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A REVIEW OF THE JAPANESE FISHES OF THE FAMILY OF AGONIDÆ.

By David Starr Jordan and Edwin Chapin Starks,
Of Stanford University.

In this paper is given a review of the species of fishes belonging to the family of *Agonidæ*, known in English as sea poachers or alligator fishes, in Japanese as tokubire or sachi, found in the waters of Japan. The material studied is preserved in the United States National Museum, in the Museum of the Leland Stanford Junior University, and in the Museums of Tokyo and Sapporo, in Japan. Most of the species are fully described in Jordan and Evermann's Fishes of North and Middle America, and only those not represented there are described in full in this paper. The new plates are by the Japanese artists, Sekko Shimada and Kako Morita.

Family AGONIDÆ.

Body angular, commonly 8-angled, the caudal peduncle 6-angled, covered with 8 to 12 longitudinal rows of imbricated, radially striated plates, the anterior edge of each plate overlying the posterior edge of the plate next in front of it; plates spinous or not. Teeth small, even, in villiform bands on jaws, and in most species on vomer and palatines, sometimes wholly obsolete; gills 3½, no slit behind the last; pseudobranchiæ large, extending down the inner side of opercle; gill rakers small; gill membranes united, free, or joined to isthmus; ventral fins thoracic, narrow, their rays I, 2; vent usually close behind ventrals; spinous dorsal large, small, or absent; anal without spines; caudal rounded, about 3 times as long as wide at base, with 10 to 12 long rays; base of pectorals usually broad, the lower rays sometimes produced; all rays of all fins simple; branchiostegal rays 6; myodome (tube of *recti* muscles) with membranaceous roof; basisphenoid absent; posttemporal not bifurcate, continuously articulated with epiotic and pterotic; pyloric cæca few, about 4 to 7; vertebræ numerous, 35 to 50.

Proceedings U. S. National Museum, Vol. XXVII—No. 1365.

Fishes of the cold seas, living among rocks or kelp, most of them of small size and fantastic form, not valued as food.

a. TILESININÆ: Spinous dorsal present, the spines 18 or 19 in number; anal rays more than 20; soft dorsal short ..... *Tilesina*, 1

aa. Spinous dorsal present, its spines 5 to 12 in number.

b. Gill membranes free from the isthmus.

c. PERCIDINÆ: Body compressed; lower jaw not projecting; plates of body spinous; first dorsal at nape.

d. Lower pectoral rays not free.

e. Teeth on vomer; no occipital spines; no barbel on snout ..... *Percis*, 2

ee. No teeth on vomer; snout with a long barbel; occipital spines present. *Agonomalus*, 3

dd. Lower pectoral rays, 7 or 8, wholly free; body short and high. *Hypsagonus*, 4

cc. BRACHYOPSINÆ: Body more or less depressed; lower jaw projecting; plates of body spinous or not; first dorsal behind nape.

f. Chin without terminal barbel.

g. Bones of snout short (not produced in form of a tube); plates of body spinous; vomer and palatines with some teeth; breast with large plates ..... *Occa*, 5

gg. Bones of snout produced into a long tube which bears the short jaws at the end; body rather robust, the plates with spines. *Brachyopsis*, 6

ff. A barbel at tip of chin; snout long (produced into form of a tube, as in *Syngnathidæ*); body subterete, very slender, its plates not spinous ..... *Pallasina*, 7

bb. AGONINÆ: Gill membranes joined to isthmus, with or without a narrow free fold behind.

j. Tip of snout without free median plate or spine; mouth inferior, lower jaw short.

k. Vomer without teeth.

l. Lower side of snout with barbels.

m. Gill membranes without barbels; a pair of complex barbels under tip of snout; one pair horizontal and one pair recurved spines at tip of snout. Lower jaw very weak; teeth feeble, sometimes wanting; plates of body mostly with spines.

n. Dorsal and anal fins very large, each with 14 to 16 soft rays ..... *Draciscus*, 8

nn. Dorsal and anal fins moderate, each with 8 to 12 soft rays ..... *Podothecus*, 9

k. Vomer with teeth.

o. Dorsal fins rather long, the rays shortened behind, the last one attached by membrane to the body; no large knife-like spine above eye.

p. Plates on body largely unarmed; no teeth on palatines; gill membranes without cirri. *Sarritor*, 10

aaa. ASPIDOPHOROIDINÆ: Spinous dorsal absent; body not compressed, its plates not spinous; mouth small, terminal; gill membranes free from the isthmus.

q. Nasal spines present; body slender. *Aspidophoroides*, 11

qq. Nasal spines wanting; body slender. *Anoplagonus*, 12

1. TILESINA Schmidt.

Tilesina SCHMIDT, Faune mer du Japon., etc., 1903, p. 16 (*gibbosa*); name only.

This genus is distinguished from all other *Agonidæ* by the very long spinous dorsal of 18 or 19 spines, and by the very long anal of 23 to 26 rays. Japan Sea.

(Named for Wilhelm Theophilus Tilesius).

1. TILESINA GIBBOSA Schmidt.

Tilesina gibbosa SCHMIDT, Fauna de la mer du Japon., etc., 1903, p. 16; Japan Sea.

This species is mentioned without description in Dr. Schmidt's paper on the fauna of the seas of Japan and Ochotsk. In a letter, dated in St. Petersburg, December 30, 1902, Dr. Schmidt gives these characters, "D. XVIII or XIX, 7 or 8; A. 23 to 26; P. 14 or 15; lateral plates 49 to 50. Peter the Great Bay (Vladivostok); Broughton Bay (Korea)."

(*gibbosus*, gibbous.)

2. PERCIS Scopoli.

Percis SCOPOLI, Int. Hist. Nat., 1777, p. 454 (*japonicus*).
Hippocephalus SWAINSON, Nat. Hist. Fishes, etc., II, 1839, p. 272 (*superciliosus*).

Body moderately elongate, compressed throughout; back elevated behind nape; 2 rows of strong, curved spines along whole length of each side (spines of the other series smaller); first dorsal fin beginning behind nape; dorsals far apart; anal fin long. Vent far back from base of ventrals. Head narrow anteriorly, abruptly broader behind; mouth terminal; median rostral plate none; nasals united in front of maxillary pedicles. Interorbital space broad, the supraocular ridges very prominent, with large, flat, triangular supraocular spine or shelf; no occipital spines. Teeth on jaws and vomer, none on palatines. Gill membranes united, free from isthmus. North Pacific.

(περκίς, a synonym of πέρκη, perch.)

2. PERCIS JAPONICA (Pallas).

Cottus japonicus PALLAS, Spicilegia Zoologia, VII, 1772, p. 30, pl. v, figs. 1–3, dry specimen; Kuril Islands (coll. G. W. Steller).—TILESIUS, Krusenstern's Reise um die Welt, IV, 1813, pl. LXXXVII.

Agonus curilicus TILESIUS, Mém. Acad. St. Petersb., IV, 1811, p. 416; after Pallas and Steller.

Agonus stegophthalmus TILESIUS, Memoirs Soc. Naturalists, Moscow, II, 1809, p. 219; Gulf of Patience, Sakhalin Island; Mém. Acad. St. Petersb., IV, 1811, p. 427, pl. XII.—GÜNTHER, Cat., II, 1860, p. 214.

Aspidophorus lisiza LACÉPÈDE, Hist. Nat. des Poiss., III, 1802, p. 224; after Pallas.

Asidophorus superciliosus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 215; Kuril Islands, after Pallas and Tilesius.

Percis japonicus SCOPOLI, Inst. Hist. Nat., 1777, p. 454.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2034; Ochotsk Sea.—SCHMIDT, Fauna Mer. Japon., 1903, p. 16; Vladivostok.

Agonus japonicus BLOCH and SCHNEIDER, Systema Ichthyologia, 1801, p. 105.
Phalangistes japonicus PALLAS, Zoog. Rosso-Asiat., III, 1811, p. 112.
Hippocephalus superciliosus SWAINSON, Nat. Hist. Fishes, etc., II, 1839, p. 272.
Hippocephalus japonicus JORDAN and GILBERT, Synopsis, 1883, p. 723.—CRAMER, Proc. Cal. Ac. Sci., 1894, p. 194, with figure.

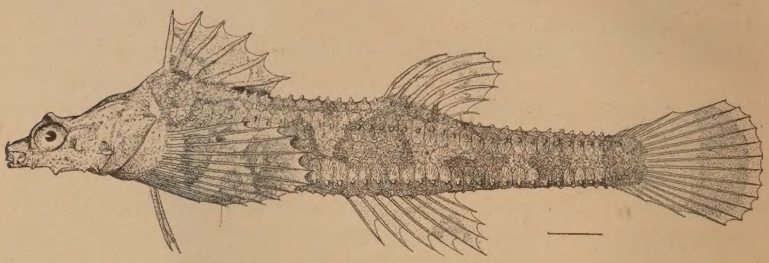

FIG. 1.—PERCIS JAPONICA.

This species has been known in recent years from a single specimen from Ochotsk Sea in the California Academy of Science, described and figured by Mr. Cramer. This account is copied by Jordan and Evermann, to whose work the reader is referred.

3. AGONOMALUS Guichenot.

Agonomalus GUICHENOT, Mém. Soc. Sci. Nat. de Cherbourg, IX, 1866, p. 252, pl. IX (*proboscidalis*).

Head and body strongly compressed, the latter entirely armed with angular osseous plates. Teeth excessively small on both jaws, none on vomer or palatines. Dorsal fins separate; a long, fleshy barbel on tip of snout; mouth small; a very high, broad, somewhat recurved spine or bony projection above each orbit; origin of first dorsal above nape, the profile from nape to fin very steep; pectoral rays somewhat exserted; gill membranes probably united and free from isthmus. Closely related to *Hypsagonus*.

(*agonus;* ὁμαλός, level, even, or flat, i. e., compressed.)

a. Lateral line pale; spines on head ridge-like; first dorsal spine slightly longer than second; anal rays 11 ..... *proboscidalis.* 3.

aa. Lateral line black; spines on head sharp; first dorsal spine notably longer than second; anal rays 13 or 14 ..... *jordani.* 4.

3. AGONOMALUS PROBOSCIDALIS (Valenciennes).

Aspidophorus proboscidalis VALENCIENNES, Comptes Rendus de l'Acad. des Sciences, XLVII, 1858, p. 1040; Port of Emperor Nicholas (Nicolaevsk), Gulf of Tartary.

Agonomalus proboscidalis GUICHENOT, Mém. Soc. Sci. Nat. Cherbourg, 1865, p. 254, pl. IX.—SAUVAGE, Nouv. Arch. Museum Hist. Nat., Paris (2), I, 1878, p. 157.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2037, after Guichenot.—SCHMIDT, Faune Mer Japon, 1903, p. 16; Vladivostok, Japan Sea.

Head 4 in length to base of caudal; depth at base of ventrals, 4. Dorsal IX—6; anal, 11; lateral line plates 27. Eye, $3\frac{3}{4}$ in head; greatest interorbital width between tips of supraocular spines, 2; maxillary, $3\frac{4}{5}$; snout, 4.

Supraocular spine triangular; its posterior side sloping at about the same angle as its anterior side; its base extends above the entire eye and its apex is directly above the pupil; at its base posteriorly is a small spine placed above a point midway between posterior border of pupil and posterior border of eye. The anterior border of the large spine forms a steep unbroken curve around front of eye to a level with lower margin of eye, becoming nearly vertical in front of eye. Interorbital space widely V-shaped, a slight longitudinal ridge at its middle. A ridge runs backward from supraorbital rim and ends in a blunt upward and outward directed spine with a small spine at its base anteriorly; between this and its opposite fellow is a depression. Nasal spines sharp, rather long, and curved backward. A blunt spine above opercle, probably on post-temporal, and a similar one on edge of preopercle, not widening outward and curving backward, making a deep notch behind it, as in *Agonomalus jordani*. A spine, sharper than the others, just behind lower posterior orbital margin. A small, sharp spine just above base of upper pectoral ray. A longer curved spine behind it above middle of pectoral. Maxillary reaching to below anterior margin of pupil. Teeth fine, villiform, in narrow bands on jaws; none on vomer or palatines. Snout nearly horizontal to nasal spines, then turning nearly vertically downward to mouth. Lower jaw included. A long barbel, half as long as head, at tip of snout; it is widened at the base and extends around the entire front of snout.

A row of 26 plates bearing hooked spines extends along the side of back from below fourth dorsal spine to the caudal; the second spine is smaller than the adjoining spines and slightly out of line with them. A row of 29 similar, slightly larger spines extends along the lower part of sides to the caudal. A row of 6 small blunt spines on side of belly curves inward to the first anal ray. A couple of tiny spines at side of interval between dorsals. The area on side of body between the upper and lower series is concave. The caudal peduncle is four cornered in section, with the long sides bowed inward toward each other. The lateral line runs along a series of small plates which are rather scattered posteriorly.

Spinous dorsal double curved in its upper outline; convex at each end and concave at its middle; the length of the first spine is contained $3\frac{2}{3}$ in body or equal to depth of body below it; the second spine is but slightly shorter; the last spine is $1\frac{2}{3}$ in head; it is connected to the body by a wide membrane which covers 5 plates. The first dorsal spine is rough, with small prickles. The rays of the second dorsal are very stiff; the first is five-eighths of the second in length; the

second and third are equal; the others decrease gradually to the last, which is one-half the length of the second, and is adnate to the body for its whole length. The base of the last anal ray is directly under the base of the last dorsal ray, but the tips of the last rays reach much farther posteriorly. The third from the last anal ray is considerably the longest; the last ray is equal in length to the second; the first ray, between which and the third from the last the rays are graduated in length, is equal in length to the distance from the tip of the snout to the posterior margin of the pupil. The pectoral has 11 rays; the fourth from the top is the longest; it fails to reach the first anal ray by a distance equal to two-thirds of the diameter of the eye; the lower pectoral rays are much produced beyond the membrane, but not disconnected, as in the genus *Hypsagonus*. The surface of the upper part of the pectoral, and especially the upper ray, is rough with small

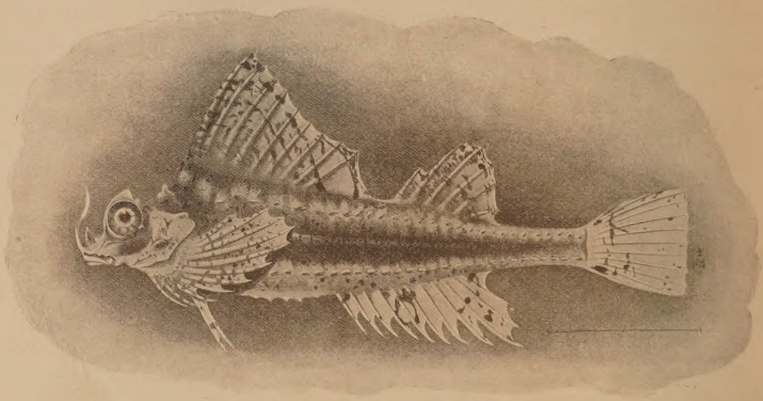

FIG. 2.—AGONOMALUS PROBOSCIDALIS.

prickles; similar prickles cover the base of the pectoral. Ventral two rayed, the inner ray the longer, just reaching to the middle of the vent. Caudal broad and rounded behind; its length is 1¼ in head.

Color.—Body pinkish, fins white; nearly everywhere with sharp irregular brown "freckles;" those on the body fewer and lighter than on fins, fading out on caudal peduncle; on spinous dorsal they are elongate and are irregularly placed in series suggesting curved bands; on posterior part of spinous dorsal is a large white oval spot with brown spots around it; the spots more sparse on anal than on other fins; very thickly scattered over pectoral; barbel at tip of snout white.

Here described from a specimen loaned by the Sapporo museum; collected at Hakodate. It is 10 cm. in length. The species is evidently identical with the type of Guichenot.

(*proboscidalis*, having a long snout.)

4. AGONOMALUS JORDANI Schmidt.

Agonomalus jordani SCHMIDT Manuscript, Aug. 13, 1903; Ochotsk Sea.

Head $4\frac{1}{4}$ in length to caudal base; depth $4\frac{2}{3}$. Dorsal IX–7; anal 13 or 14. Eye $3\frac{2}{3}$ in head; interorbital width directly above pupil 3; maxillary $3\frac{4}{5}$.

Superorbital spine sharp and slender as compared with *A. proboscidalis;* its point directed upward and backward; it is placed above posterior margin of pupil about where the second superorbital spine is in *A. proboscidalis.* Its base is short, not extending anterior to pupil; its anterior margin does not follow down the front of eye in a simple unbroken curve; there is no second superorbital spine. Interorbital space broadly V shaped. Vertex depressed between the backward-extending ridges from superorbital rim. Spine at parietal region sharp, directed backward and upward, without a small spine at its

FIG. 3.—AGONOMALUS JORDANI.

base. Nasal spines slender and sharp. Spine at post-temporal region very sharp and directed backward. The spine at edge of preopercle is wide and flat, growing wider outward and turning sharply back, thus forming a deep notch between it and the head; toward its end it divides into several small sharp points, each of which is at the end of a slight ridge. A sharp spine just behind lower posterior orbital margin. A small sharp spine just above the base of the upper pectoral ray, but no large spine on body behind it above middle of pectoral, as in *A. proboscidalis.*

Maxillary reaching to below anterior orbital margin. Teeth in narrow bands in jaws, none on vomer or palatines. Lower jaw included. Barbel apparently as in *A. proboscidalis* (specimens have been dried).

Upper lateral row of spines, 25 in number, differing from those of *A. proboscidalis* in being slenderer and sharper, the first under third

dorsal spine, the second not smaller and out of line with the adjoining ones. Lower row similar, of 28 spines. The spines at side of belly very much sharper and longer than in *A. proboscidalis*.

Spinous dorsal nearly straight in its upper outline; the spines are all produced more than in *A. proboscidalis*, and the first spine is conspicuously longer than the second. First spine $3\frac{1}{3}$ in length to caudal base; $\frac{2}{5}$ to $\frac{1}{2}$ longer than depth of body below it; second spine equals length of head; last spine $1\frac{4}{5}$ in head. The soft dorsal more rounded or less triangular in outline than in *A. proboscidalis*, the tips of the rays more produced beyond the membrane. The distance between the dorsals is the same, and the membrane connecting the last spine to body is the same. Anal longer, but similar in shape; the third ray from the last is $1\frac{1}{3}$ in head. Pectoral similar in shape, number of rays, and in the relationship of its tip to front of anal to *A. proboscidalis;* its greatest length exceeds that of head by half the diameter of eye. Ventrals reaching to vent. Caudal rounded; its length 1 to $1\frac{1}{6}$ in head.

Color.—Back brown; sides lighter; a dark, irregular band along base of anal; with or without dark brown spots just above and below anterior spines of lower lateral series; lateral line running in a narrow, sharp, very dark band; a dark streak following suborbitals, and another around edge of preopercle; barbel at tip of snout dark; on membrane between first and second dorsal spines are three or four dark, conspicuous spots with translucent interspaces; the first brown spot at upper margin of membrane, one or two small dark spots on membrane between last spine and body; the membrane between each spine is narrowly edged with brown blended downward; the membrane of soft dorsal margined with much larger spots between the rays; the tip of each dorsal spine and ray white, softly blended downward; the body of the dorsals uniform dusky; caudal with a cross band at its middle formed by dark blended spots on the membranes between each ray; a long dark spot on the posterior end of membrane between each ray; the rays tipped with white; pectoral dark above, somewhat mottled toward end; anal and ventrals white, the former dark brown toward its posterior end.

The species differs from *Agonomalus proboscidalis* in having all of the spines on the head sharp and directed backward; the superorbital spine single and placed posteriorly; the first dorsal spine conspicuously longer than the second; the upper outline of the fin not so deeply concave; the anal longer; the color very different. Other and less conspicuous differences are indicated above.

This species is in Dr. Schmidt's collection from the Ochotsk Sea. Dr. Schmidt writes of it: "Das ist wohl die schönste neue Species die ich in meinen Sammlungen gefunden habe." In view of the possible priority of Dr. Schmidt's paper we suppress the name we had devised for this fish.

Our description is from a dried specimen, 158 mm. in length, from Shiraoi, Hokkaido, presented by Dr. Bashford Dean. It is numbered 7731, Ichthyological Collections, Leland Stanford Junior University Museum. Four dried specimens were secured at Hakodate. One of them is preserved in the U. S. National Museum.

(Named for David Starr Jordan.)

4. HYPSAGONUS Gill.

Hypsagonus Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 259 (*quadricornis*).
Cheiragonus Herzenstein, Bull. Acad. Imp. Sci. de St. Petersb., XIII, 1890, p. 116 (*gradiens* = *quadricornis*).

Body compressed, elevated, depth greater than length of head, more than $\frac{1}{3}$ of body; head small, separated from first dorsal by a very deep nuchal depression; top of head very uneven, 1 pair of large

Fig. 4.—Hypsagonus quadricornis.

supraocular and 1 pair of large occipital spines, strong, blunt; mouth terminal, jaws about equal, a large barbel or none at tip of snout; teeth on jaws, none on vomer or palatines; gill membranes united, free from isthmus; scales or plates large, radially striated, with a central spine or tubercle; 2 rows of strong and 2 of weaker spines along side of body; dorsal fin long, high, beginning immediately behind nape, the spines strong, the first serrated; pectorals short, procurrent, the lower 8 or 9 rays free; ventrals small; vent nearly halfway between ventrals and anal.

This genus differs from *Agonomalus* in having a row of small spines along base of dorsals, continuous on dorsal side of caudal peduncle as a median row; in having the row of spines at side of belly continuous along base of anal and median ventral surface of caudal peduncle, and in having the lower 7 or 8 pectoral rays free.

(ὑψι – high; *Agonus*.)

5. HYPSAGONUS QUADRICORNIS (Cuvier and Valenciennes).

Aspidophorus quadricornis CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 221; Kamchatka. (Coll. Dr. Collée. Type in British Museum.)

Hypsagonus (*Cheiragonus*) *gradiens* HERZENSTEIN, Bull. Acad. Imp. des Sci. de St. Petersb., XIII, p. 116, May 29, 1890; Kamchatka, Avatcha Bay, Port Petropavlovsk.

Agonus quadricornis GÜNTHER, Cat., II, 1860, p. 215.

Hypsagonus quadricornis GILL, Proc. Ac. Nat. Sci. Phila., XIII, 1861, p. 167.—JORDAN and GILBERT, Synopsis, 1883, p. 722.—GILBERT, Rept. U. S. Fish Comm., 1893 (1896), p. 439.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2038; Aleutian Islands, Bristol Bay, Puget Sound.—SCHMIDT, Faune Mer Japon., 1903, p. 16 (Aniva Bay, Sakhalin), Ochotsk Sea.

This species is fully described by Mr. Cramer in Jordan and Evermann's Fishes of North and Middle America, to which account we have nothing to add.

5. OCCA Jordan and Evermann.

Occa JORDAN and EVERMANN, Fish North and Middle Amer., II, 1898, p. 2043.

This genus differs from *Brachyopsis* in the short snout, which is not tubular. From *Stellerina* it is separated by the large plates on the breast, and by the presence of at least a few teeth on the vomer and palatines. North Pacific.

(*occa*, a harrow.)

a. No spine on suborbital stay; dorsal IX or X, 7 or 8 ..... *dodecaedron*, 6.
aa. A spine developed on suborbital stay; dorsal XII, 8 or 9..... *iburia*, 7.

6. OCCA DODECAEDRON (Tilesius).

FIG. 5.—OCCA DODECAEDRON.

Agonus dodecaedron TILESIUS, Mém. Acad. Petersb., IV, 1810, pl. XIII; Kamchatka (Coll. W. T. Tilesius).—GÜNTHER, Cat., II, 1860, p. 214.

Phalangistes loricatus PALLAS, Zoog. Rosso-Asiat., III, 1811, p. 114, pl. XIX; Kamchatka.

Aspidophorus dodecaedrus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 209.

Brachyopsis dodecaedrus JORDAN and GILBERT, Synopsis, 1883, p. 723.

Occa dodecaedron JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2043; Bristol Bay.—JORDAN and GILBERT, U. S. Fur Seal Commission, III, 1898, p. 479; Iturup Island.—SCHMIDT, Faune Mer Japon., 1903, p. 16; Aniva Bay, Vladivostok.

Kamchatka and Kuril Islands.

The species is fully described by Mr. Cramer in Jordan and Evermann's Fishes of North and Middle America, to which the reader is referred.

(δωδεκα, twelve; ἕδρα, surface, side.)

7. OCCA IBURIA Jordan and Starks, new species.

Head $4\frac{1}{2}$ in length to base of caudal; depth $7\frac{1}{2}$. Dorsal XII—8 or 9; anal 16; lateral line plates from upper end of gill opening 43. Eye $5\frac{2}{3}$ in head; snout $4\frac{1}{4}$; interorbital space $4\frac{1}{2}$; maxillary $2\frac{5}{8}$.

Body to posterior third of caudal peduncle depressed. Spines present on all dorso-lateral plates and median dorsal plates of caudal peduncle; the latter very small, but evident. Spines on all inferior lateral series of plates behind tip of pectoral, and on all superior lateral series. Spines on ventro-lateral series from tips of ventral to end of anal; the anterior spines rather blunt; all of them smaller than

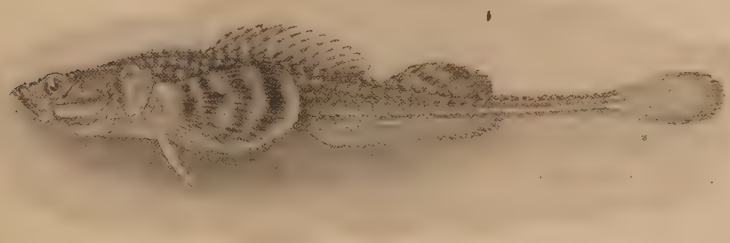

FIG. 6.—OCCA IBURIA.

in the other series. Posterior to the middle of the pectoral the lateral line plates are small, not nearly so large as those of the adjoining series; they bear small spines, which are enlarged anteriorly, back to opposite the middle of the soft dorsal. There are thirteen plates between the base of the last dorsal ray and the caudal fin; four or five of these are single plates, eight or nine are paired; the membrane of the last dorsal ray covers a little over three plates. Between the base of the last anal ray and the caudal are eleven plates, two of which are single median plates. A strong ridge of blunt plates runs from the lower pectoral ray to the gill opening, where it meets a ridge bordering the gill opening from the upper pectoral ray to the isthmus. Breast, the region covered by the pectorals and a portion about anus are rough with small tubercles. A triangular area on branchiostegal membrane and a Y-shaped area at chin between mandibles are rough with prickles.

Lower jaw strongly projecting. Teeth, fine, villiform, in narrow bands on jaws, vomer, and palatines. Maxillary reaching to below

anterior edge of pupil. Nasal spines well developed, but not very sharp. A spine developed at the center of the bony buckler on cheek. A very strong ridged spine at angle of preopercle, and three smaller ones below on edge of preopercle; the lowest represented by a very small, blunt tubercle. Superorbital rim produced in a rough ridge. A low, rough ridge curves back from superorbital rim to over parietal region. Top of head concave. A thin, flat tentacle at end of maxillary.

First dorsal spine between the seventh and eighth plates on back. The spinous dorsal covers eleven plates, and the membrane of the last spine covers a little over three plates. There are four plates between the dorsals counting between the bases of the rays. The length of the third dorsal spine is equal to the length of the snout and the eye combined. The soft dorsal covers seven plates to the base of the last ray. The longest rays are scarcely equal in length to the longest spines. The anal covers fifteen plates. The tip of the last anal ray reaches past that of the last dorsal ray a space covering nearly two plates. The longest anal rays equal the length of the snout and half the eye. One of our specimens has two ventral rays, as in *O. dodecaedron*. The other has a third inner ray developed half as long as the other rays. The length of the ventrals is $2\frac{1}{5}$ in head. The pectoral is very broadly rounded behind; there is only a little difference between the upper ten rays in length (scarcely half the diameter of the eye); below the rays rapidly decrease in length. The pectoral barely fails to reach to opposite the first anal ray. Caudal rounded; its length $1\frac{3}{5}$ in head.

Color.—Dull brown on back, fading just below lateral line into the white of under parts; no irregular dark stripe along side, as in *O. dodecaedron*, or no sharp black points on pectorals; lower lip dark brown, under part of head otherwise white; maxillary tentacle milk white; pectoral with three or four irregular, wide, brown, blended crossbars; spinous dorsal with slight, inconspicuous brown spots on the spines indicating oblique cross lines; soft dorsal with two brown oblique bars, the second one very wide and bordering the fin posteriorly; anal white; its posterior third or fourth dusky; ventrals white; caudal dark brown.

This species differs from *Occa dodecaedron* in having the spines better developed on the ridges of the body, in having a greater number of dorsal spines, in having spines developed on nasals and cheeks, in having the plateless regions under pectoral and on breast rougher and in color. (Compared with specimens of *O. dodecaedron* collected by the U. S. Fish Commission steamer *Albatross* at station 3239, Alaska.)

The type from Tomakomaki in Iburi, Hokkaido, is 20 cm. in length and is numbered 7730 Ichthyological Collections, Leland Stanford Junior University Museum. A cotype very similar, from the same locality, is loaned by the Sapporo Museum.

6. BRACHYOPSIS Gill.

Brachyopsis GILL, Proc. Ac. Nat. Sci. Phila., XIII, 1861, pp. 167, 259 (*rostratus*).
Siphagonus STEINDACHNER, Ichth. Beiträge, V, p. 140; Sitzb. Acad. Wiss. Wien, LXXIV, July, 1876 (*segaliensis*).

Body moderately elongate, tapering nearly uniformly from head to caudal; depressed, 8-hedral (6-hedral on peduncle); depth about 8, width about 6 in length; head broad, depressed, about 4½ to 5 in standard length. Snout long, almost tubular, bearing the short jaws at the end. Plates in dorsal series about thirty-five to forty or more; a barbel at tip of each maxillary; median rostral plate none; nasal spines minute or absent; supraocular and occipital spines none; gill membranes united, free from isthmus; anal fin long, with twelve or thirteen rays, first dorsal usually long; mouth oblique, lower jaw projecting; teeth present on jaws, vomer, and palatines; at least some of the plates on body spinous; plates on breast usually with interspersed small prickles or tubercles.

(*βραχύς*, short; *ὄψις*, face.)

a. Eye in front of middle of head; no spines on suborbitals.....*rostratus*, 8.
aa. Eye behind middle of head; two spines on suborbitals.....*segaliensis*, 9.

8. BRACHYOPSIS ROSTRATUS (Tilesius).

Agonus rostratus TILESIUS, Mém. Acad. Petersb., IV, 1810, pl. XIV; Sakhalin, Gulf of Aniva. (Coll. Tilesius.)
Phalangistes fusiformis PALLAS, Zoog. Rosso-Asiat., III, 1811, p. 116; Sakhalin, Gulf of Aniva, Kuril Islands. (Coll. Steller and Merk.)
Agonus rostratus GÜNTHER, Cat., II, 1860, p. 214.
Aspidophorus rostratus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 212.
Brachyopsis rostratus JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2046.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., II, p. 471, pl. LXX; Iturup Island, Hokkaido.—SCHMIDT, Faune Mer Japon., 1903, p. 16; Vladivostok, Aniva Bay.

This species is fully described by Mr. Cramer in Jordan and Evermann's work.

A large dried specimen 10½ inches long was found at Hakodate, and three smaller ones were loaned by the Sapporo Museum, taken at Tomakomaki, near Mororan. They agree very well with a specimen from Iturup Island, from which Cramer's description was made, except that they show a greater variation in fin rays. The specimen from Hakodate has the dorsal rays VIII, 8; and the anal, 13. The other three are as follows: Dorsal IX, 7; anal, 11; dorsal VIII, 7; anal, 12; dorsal IX, 8; anal, 13.

North Pacific, recorded from Sakhalin, Gulf of Aniva, Petropavlovsk, and the Kuril Islands.

(*rostratus*, pertaining to the *rostrum* or snout; "not because it has a beak, but because its head and snout are more contracted than in the others.")

9. BRACHYOPSIS SEGALIENSIS (Tilesius).

Syngnathus segaliensis TILESIUS, Mém. Soc. Imp. Nat. de Moscow, II, 1810, p. 216, pl. XIV; Bay of Patience, Sakhalin. (Coll. Krusenstern.)

Siphagonus segaliensis STEINDACHNER, Ichth. Beiträge, V, p. 140, and Sitzb. der k. Acad. der Wiss., LXXIV, 1876.—JORDAN and GILBERT, Synopsis, 1883, p. 723.

Agonus lævigatus TILESIUS, Mém. Acad. Petersb., IV, 1810, p. 436; Sakhalin; CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 214.

Phalangistes lævigatus PALLAS, Zoog. Rosso-Asiat., III, 1811, p. 116.

Brachyopsis segaliensis JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2048 (copied).

This species from the island of Sakhalin is unknown to recent writers. A brief description is given by Cuvier and Valenciennes, condensed by Jordan and Evermann in the work above cited.

(Name from Sakhalin.)

7. PALLASINA Cramer.

Pallasina CRAMER, Proc. Cal. Ac. Sci., 1895, p. 815 (*barbata*).

Form of *Syngnathus;* body slender, depressed; 4-hedral anteriorly, 8-hedral under dorsals; 6-hedral on peduncle; snout produced in a tube; lower jaw projecting beyond upper, turned upward at tip, a long barbel at the symphysis; teeth on jaws and vomer, a single row on palatines; gill membranes free from isthmus, united; both dorsals present; ventrals very short; plates of body slightly keeled, without spines; vertebræ about 45.

(Named for Petrus Simon Pallas, naturalist and explorer, the accomplished author of Zoographia Rosso-Asiatica, 1811.)

10. PALLASINA BARBATA (Steindachner).

Siphagonus barbatus STEINDACHNER, Ichth. Beiträge, V, p. 140, pl. v; Sitzb. der k. Acad. der Wiss., LXXIV, July, 1876; Japan.—JORDAN and GILBERT, Synopsis, 1883, p. 725.—JORDAN, Cat., 1885, p. 113.—SCHMIDT, Fauna mer Japon., 1903, p. 16; Aniva Bay, Vladivostok.

Pallasina barbata CRAMER, in Jordan and Evermann, Fish. North and Middle Amer., II, 1898, p. 2049; Bristol Bay, Bering Strait, Tareinsky Bay, Port Clarence.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898, p. 471; Iturup Island, Yakutat.

Head, 4 to 4½ in length. Dorsal V to VII–7 or 8; anal, 9 to 11. Lateral line, 46 to 51. Body slightly depressed in front, depth at base of pectorals five-sixths or six-sevenths of width, slender, width about 12 in length. Ridges of the dorso and ventro lateral series strong, the dorsal and lateral halves of the plates form a right angle; no ridge on the inferior lateral row and the plates of the superior lateral row absent anteriorly, so that the body is 4-hedral in front of first dorsal, with dorsal and ventral faces flat or a little concave and the lateral convex. Under first dorsal the superior lateral series begins with keeled plates, the ridge of the inferior lateral series becoming more prominent, so

that under the dorsals the body is 8-hedral: dorsal and ventral faces grooved, and depth equaling length. Caudal peduncle strongly depressed, nearly 4-hedral (median dorsal and ventral ridges extremely low); 49 or 50 plates in the dorsal series, 4 or 5 pairs between dorsals, 13 or 14 pairs from ventrals to anal; 3 or 4 large plates in a median longitudinal row on breast, with about 1 row of 4 or 5 small ones between it and the series forming the edge of breast; plates radially striated and a little elevated at the center; none between ventrals and vent. Branchiostegal membrane naked posteriorly, 2 or 3 plates anterolaterally. Narrow nude surface of lower jaw with a series of several plates; 2 or 3 plates in front of pectoral. Head very long and narrow, gently tapering, nearly as high as wide. Orbits nearly circular, the longitudinal diameter 5⅓ to 6 in head and 2½ in snout. Interorbital space moderately concave, nearly 2 in orbit. Supraocular ridges moderate, occipital ridges scarcely defined, temporal ridges moderate, all spineless; no suborbital ridge; suborbital bone spineless; a sharp spine at posterior angle of preopercle and 2 smaller flat ones below; a longitudinal series of 4 or 5 poorly developed plates on lower part of cheek, between the long horizontal limb of preopercle and orbit.

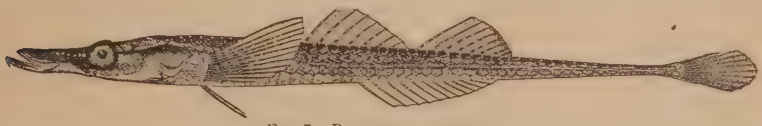

Fig. 7.—Pallasina barbata.

Snout long, tubular, about 2½ in head. Frontal bones much elongated forward, an additional bony plate in front of preorbital and overhanging the maxillary; several small plates in membranaceous interval between preorbital and frontal in front of orbit. Posterior inferior angle of maxillary produced backward, reaching a little more than halfway to orbit. Median rostral plate absent. Lower jaw long, curved upward in front, projecting beyond the upper and entering profile; mouth oblique. Teeth in narrow bands on jaws and vomer, about 1 row on palatines. A single barbel of variable length in specimens from Nemuro; it is little developed, shorter than eye; in those from Aomori, at its longest; it is longer than head at tip of lower jaw. Gill membranes united behind, free from isthmus. First dorsal with 12 to 14 pairs of plates between it and the occiput; anal long, beginning under middle of first dorsal; pectorals long, 5½ to 6 in body, width at their base about 4 in their length; ventrals about 3 in pectorals and 4 in head in female, 2 in pectorals and 2⅔ in head in male. Color reddish or grayish brown with innumerable minute black points; ventral surface pale, from front of anal to caudal progressively darker with minute black spots; a dark band extends along the side of snout, across orbit and preopercle; anterior dorsal dusky, darker behind;

second dorsal indefinitely cross-banded with short streaks of darker on rays; caudal dusky; pectoral pale, indefinitely banded with short streaks of darker on rays; ventrals pale in both sexes; anal pale.

North Pacific, south to Japan and Oregon; Arctic Ocean near Bering Sea (W. J. Fisher, Steindachner); Bering Sea, Bristol Bay (Gilbert); Tareinsky Bay (Barrett-Hamilton); Port Clarence, Alaska (Scofield). A variable species. The specimens here described are four from Aomori, the longest 12 cm. in length, and an equal number from Nemuro, loaned us by the Sapporo Museum. Still others are from Mororan. This is much the most abundant of the Agonidæ of Japan, occurring in eel grass in shallow bays.

(*barbatus*, provided with a barbel.)

8. DRACISCUS Jordan and Snyder.

Draciscus JORDAN and SNYDER, Proc. Cal. Acad. Sci., 1901, p. 379 (*sachi*).

Closely allied to *Podothecus*, from which it differs in the extraordinary size of its soft dorsal and anal fins, each of which has 14 to 16 rays.

(δράκο, a dragon.)

11. DRACISCUS SACHI Jordan and Snyder.

Draciscus sachi JORDAN and SNYDER, Proc. Cal. Ac. Sci., 1902, p. 379, pl. XIX; Aomori, Kayabe, Hokkaido.

Head 3½ in length; depth 7⅛; snout 2 in head; eye 4⅔; D. VIII–14; A. 16; P. 15; spines in lateral line 44.

Body formed about as is usual in *Podothecus;* caudal peduncle long and slender, contained about four times in the length. Snout long and pointed; two spines on tip of snout above; two small, closely apposed spines behind middle of snout, at the end of its second third; ridge of mouth with a small double spine at its extremity; a stout spine above eye. Bones of sides of head with granular, radiating ridges. Tip of upper jaw and angles of mouth with clusters of barbel. their length equal to more than one-half the diameter of eye. Side[illegible] body with 4 longitudinal rows of spinous plates, the spines sto[illegible]e upper row begins at nape and extends to base of second dorsal; the other 3 rows run from head to base of caudal. Plates on breast without spines.

First dorsal rather high; its first spine highest, contained about 2⅔ times in head. Soft dorsal inordinately high; its middle rays longest, 2⅔ in length. Anal still larger, a little higher and beginning farther forward, the highest rays behind the middle; its height about 2⅔ in length; pectorals rather long, 4⅗ in body; some of the lower rays produced and with free tips. Ventrals short, 3⅔ in head.

Color.—Brownish, with some dark blotches on back. Vertical fins dusky, becoming black on distal portion, each fin with irregular rows

of round, white spots in the dark marginal areas. Pectorals pale, with a dusky blotch at base. Ventrals pale.

The type is a single dried specimen 240 mm. long, presented to the Museum of Leland Stanford Junior University by Mr. Sotaro Saito, Director of the Museum of Aomori, Japan. It is type No. 6431 on the Stanford Museum register. It was taken in the Bay of Aomori, where the species is locally known as Sachi.[a]

No specimens were taken by us in Japan, but other dried specimens were seen, the expanded fins rendering it one of the local curiosities. One of these, 385 mm. long, in the Imperial Museum of Japan, numbered 817, from Hokkaido, agrees closely with the type specimen. (D. VIII–13; A. 15; P. 16; scales 40.) Another from Hokkaido differs

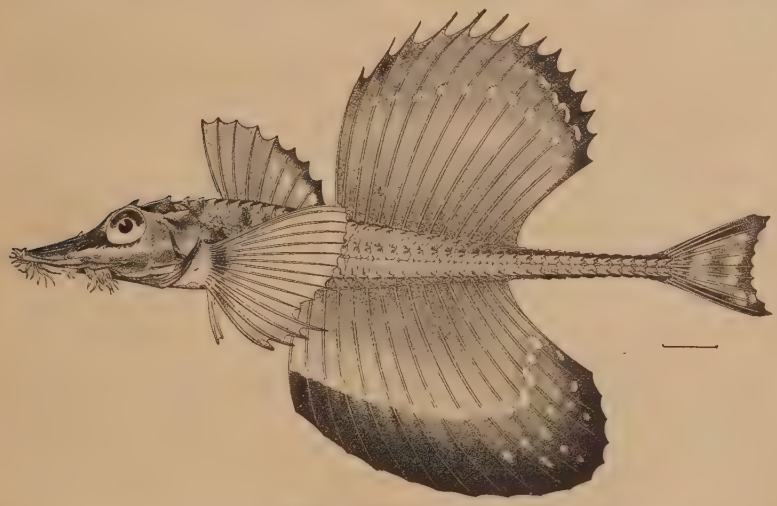

FIG. 8.—DRACISCUS SACHI.

slightly in markings of the fins. In the museum of Hakodate is a specimen from Kayabe, called by the local name of "Tokuhire," by error for ebire, meaning "handy fins." There is also another specimen in the Museum of Aomori from Aomori Bay.

9. PODOTHECUS Gill.

Podothecus GILL, Proc. Ac. Nat. Sci. Phila., XIII, 1861, pp. 77, 259 (*peristethus*= *acipenserinus*).

Paragonus GILL, Proc. Ac. Nat. Sci. Phila., XIII, 1861, pp, 167, 259 (*acipenserinus*).

Body tapering nearly uniformly from head to caudal, about as high as or higher than wide anteriorly; depth about 6 to 8 inches in length; head about 4, compressed; plates in dorsal series about 35 to 40, 4 or 5

[a] *Blepsias draciscus* is called Sachiko; that is, child of the Sachi. Sachi in Japanese means good fortune.

pairs between occiput and first dorsal fin; gill membranes joined to isthmus, without free fold; no scattered barbels under lower jaw or on branchiostegal membranes; 2 complex groups of barbels on under side of tip of snout, another group at each angle of mouth; usually a few barbels at sides of pores under lower jaw; tip of snout with usually 2 pairs of sharp slender spines, the anterior directed forward, the posterior outward and backward. Mouth small, inferior, snout projecting far beyond it. Teeth on both jaws few and weak, sometimes wanting on one or both jaws; none on vomer and palatines; plates of body spinous; 1 pair of supraocular and 1 pair occipital spines; both dorsals present. This genus is very close to *Agonus*, differing mainly in the spinous plates of the body. The numerous species differ much among themselves.

(πούς, foot; θήκη, box; from the groove for the receptacle of the ventrals which appears through the shrinking of the naked skin in preserved specimens.)

a. Plates on caudal peduncle all or nearly all armed each with a spine.
  b. Barbels below snout very numerous and large; angle of mouth with many barbels.
    c. Soft dorsal with 13 rays; fins low; ventrals short; pectorals large..*tokubire*, 12.
    cc. Soft dorsal with 8 or 9 rays.
      d. Dorsal rays VIII–9; teeth well developed; fins all very high, the pectoral emarginate in the adult, its longest ray 1¼ in head; ventral long; anal rays 10 ..... *accipiter*, 13.
      dd. Dorsal rays IX–8; teeth small; fins high; pectoral emarginate; ventral short; anal rays 10 ..... *sturioides*, 14.
      ddd. Dorsal rays XI–8; teeth present; fins moderate; pectoral not emarginate; ventral short; anal rays 9 ..... *hamlini*, 15.
  bb. Barbels comparatively few and slender.
    e. Dorsal rays VIII–8; teeth in upper jaw almost obsolete; fins moderate; pectoral not emarginate, 1½ in head; ventral very short; anal rays 9. *gilberti*, 16.
    ee. Dorsal rays IX–6; fins small; ventrals long; sides and top of head with very large crests; anal rays 6 ..... *thompsoni*, 17.
aa. Plates on caudal peduncle mostly not ending in spines; fins rather low, the anal rays 7 or 8.
    e. Teeth wanting in the adult; barbels rather small and sparse; body not everywhere deeper than wide; the caudal peduncle very long, slender, and depressed ..... *veternus*, 18.

12. PODOTHECUS TOKUBIRE Ishikawa.

TOKUBIRE or TOKUHIRE (HANDY FINS).

Podothecus tokubire Ishikawa Manuscript, 1902; Hokkaido.

The type of this species, a stuffed example in the Imperial Museum of Tokyo, is thus described by Dr. Ishikawa in a letter to the writers:

Head 80 mm.; snout to occiput 56; depth of head 36; D. IX–13; lateral plates 40–41; pectoral 17; eye 15; snout 43; second and third

dorsal rays 29; caudal 36; upper ray of pectoral 53; longest ventral ray (seventh) 30 mm.

The body elongated, angular; the head irregularly triangular as viewed from above; the mouth entirely inferior, crescent-shaped, wide, the lower jaw shutting behind the upper by the distance equal to two-thirds the longitudinal diameter of the eye; a few teeth along the sides of the upper jaw, villiform teeth in the lower jaw; no palatine or vomerine teeth. A patch of barbels below the snout in front of the mouth, a patch of fewer ones at the symphysis of the mouth. A pair of short rostral spines pointing forward; another pair of slightly larger spines pointing upward, backward, and slightly outward is seen a little behind the base of the rostral spines. These second series of spines form the front edge of the ridges which bound the elongated groove, in the middle of which is a sharp spine; the ridges approach each other until they meet at halfway between the nostril and the anterior border of the eye, where they end in a pair of sharp spines pointing upward, backward, and outward. A pair of large spines above the posterior border of the eye, and a pair of large ones at the occiput, which is continuous with the spine above the eye by a sharp ridge; a curved ridge running from the superior rim and ending in a small spine just above the opercle; two small spines along this ridge, the anterior one rather sharp, and the posterior broad, and lies midway between the supraorbital spine and the supraopercular spine; a ridge on the suborbital continuous from the rostrum along the lower edge of the preorbitals and ending in a rather sharp spine on the lower third of the suborbital below the middle point of the eye; this ridge is high and fine serrated on the greater part of the preorbitals and with a spine directed outward. The interorbital space slightly more than the vertical diameter of the eye, deeply concave, with a pair of ridges on each side, converging forward; a diagonal depression on the occiput, traversed by a rather broad transverse ridge. Dorsal ridges converging from the occiput to behind the soft dorsal, uniting on the second plate behind the base of the last dorsal ray, continued as a single ridge on about 8 plates, where it becomes obsolete; the upper lateral ridge follows the course of the lateral line to the ninth plate, where the latter slants downward and outward as parallel rows to the base of the tail; the lower lateral ridge runs parallel with and converging anteriorly with the upper, and becomes obsolete on the second plate behind the base of the pectoral; a single spine above the base of the pectoral indicating an obsolete ridge between the lateral ridges; abdominal ridges widely apart in front between the pectoral fins, uniting behind the anal, and run backward till to the base of the caudal, where it becomes nearly obsolete; all ridges with sharp, recurved spines with the exception of the abdominal ridges behind the eighth anal ray, where the dorsal and anal rays disappear;

the caudal peduncle assumes the quadrangular shape, the corners being framed by the spines of the lateral ridges; no row of spines around base of caudal or pectoral. Dorsal and anal fins not very high; the origin of the dorsal on the fourth dorsal plate, and covers 8 plates, the membrane covering 2 more; the first dorsal spine probably the longest, "a membrane connecting the last spine to the body for the whole length;" the second dorsal begins at 2 plates behind the first, and covers 12 plates, a membrane covering two-thirds of a plate more; the dorsal fin being in part broken; the longest rays are not to be recognized; the last ray is connected to the body by a membrane; this fin begins at about behind the last ray of the first dorsal, and continues to the penultimate ray of the anal; the pectoral fin very broad and large, the tips of the first ray reaching to the twelfth lateral plates if laid backward. The origin of the ventrals slightly in front of the pectorals; very short, with their tips reaching to the third ventral plate; the caudal moderate, probably truncated.

The color of the body not recognizable, being very much faded, but most probably like that of the American species.

A single stuffed specimen from Hokkaido, with the total length of 310 mm.

13. PODOTHECUS ACCIPITER Jordan and Starks.

Podothecus accipiter JORDAN and STARKS, Proc. Cal. Ac. Sci., 1895, p. 816, pl. LXXXVIII; Robben Island.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2055.

Of this species, fully described by Jordan and Starks, only the type is known.

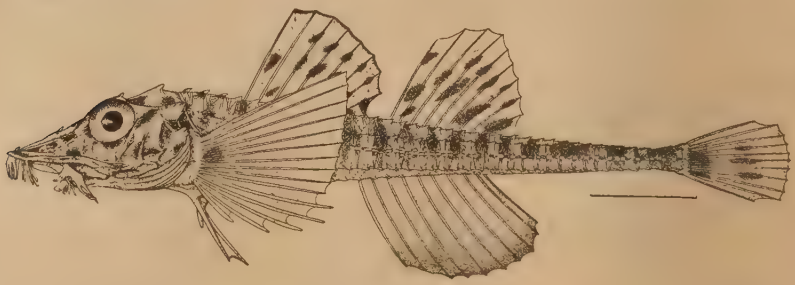

FIG. 9.—PODOTHECUS ACCIPITER.

Okhotsk Sea; one specimen collected at Robben Island by Capt. J. G. Blair. It is 8 inches in length.

(*accipiter*, a hawk; in allusion to the large fins.)

14. PODOTHECUS STURIOIDES (Guichenot).

Paragonus sturioides GUICHENOT, Nouv. Archiv. Mus., p. 202, pl. XII, fig. 3; China.

Podothecus sturioides JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1895, p. 2063 (copied).

This species from the coast of northern China is known only from Guichenot's description, translated by Jordan and Evermann. A single specimen, 10½ inches long. China. (Guichenot.) Guichenot's figure gives one more ray in anterior dorsal than the description, and gives the caudal fin as strongly concave.

(*sturio* sturgeon; *εἶδος*, likeness.)

15. PODOTHECUS HAMLINI Jordan and Gilbert.

Podothecus hamlini JORDAN and GILBERT, Rept. Fur Seal Invest., 1896, III, 1898, p. 472; Shana Bay, Iturup Island, Kuril group (type 5662, L. S. Jr. Univ. Mus., Coll. *Albatross*).—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2056; Iturup Island.

This species is fully described by Jordan and Evermann. A specimen in the Museum of Hakodate from Kayabe seems to belong to it. The types are two specimens from the U. S. Fish Commission steamer *Albatross* station 3653, off Shana Village, Iturup Island, in 18 fathoms.

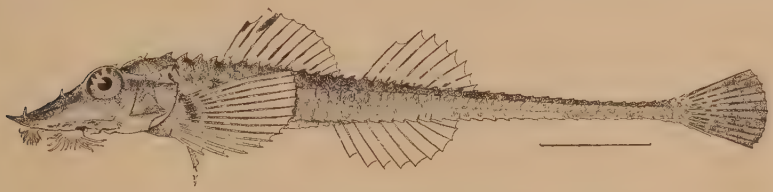

FIG. 10.—PODOTHECUS HAMLINI.

A young individual from *Albatross* station 3646, off Robben Island, 18 fathoms, seems to belong to the same species, but has the snout less produced and the dorsal VIII, 6; anal 8. Dr. Schmidt regards the species as the young of *P. gilberti*. This is possibly the case.

(Named for Charles Sumner Hamlin, late Assistant Secretary of the Treasury, under whose auspices the fur-seal investigations of 1896 and 1897 were carried on by the United States Fur Seal Commission.)

16. PODOTHECUS GILBERTI (Collett).

Agonus gilberti COLLETT, Proc. Zool. Soc. London, 1894, p. 670, pl. XLV; Kamchatka. (Coll. Henry Lund. Types, Mus. Christiania; cotype, 2783, L. S. Jr. Univ. Mus.)

Podothecus gilberti JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2058, from one of Collett's types from Petropavlovsk.

This specimen, originally known from Kamchatka, is recorded from off Cape Pestschnuzoff, Korea, by Peter Schmidt.

(Named for Charles Henry Gilbert.)

17. PODOTHECUS THOMPSONI Jordan and Gilbert.

Podothecus thompsoni JORDAN and GILBERT, Rept. Fur Seal Invest., III, 1896, p. 473, pl. LXXII; off Shana Bay, Iturup Island, at *Albatross* station 3653, in 18 fathoms (type No. 5667, L. S. Jr. Univ. Mus., Coll. *Albatross*).—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2060; Iturup Island.—SCHMIDT, Faune Mer Japon, 1903, p. 16; Japan Sea, Ochotsk Sea.

Shana Bay, Iturup Island, Kuril group. Recorded by Dr. Peter J. Schmidt, off Cape Pestschnizoff, Korea, in lit. 1903.

FIG. 11.—PODOTHECUS THOMPSONI.

(This species is named in honor of D'Arcy Wentworth Thompson, of the University at Dundee, commissioner of Great Britain in the fur-seal investigations in Bering Sea in 1896 and 1897.)

18. PODOTHECUS VETERNUS Jordan and Starks.

Podothecus veternus JORDAN and STARKS, Proc. Cal. Ac. Sci., 1895, p. 819, pl. LXXXIX; Robben Island (Coll. Captain Blair. Type presented by Alaska Commercial Company to L. S. Jr. Univ. Mus., No. 4823).—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2063, same type.

A single specimen, about 8 inches in length, collected by Captain Blair at Robben Island. This species is related to *P. acipenserinus*

FIG. 12.—PODOTHECUS VETERNUS.

and *P. gilberti*, differing from the former in having fewer and shorter barbels, teeth on jaws obsolete, keel and preopercle larger, dorsal ridges without spines posteriorly, and the spines on the preorbital ridge different in shape; from the latter in having the body different in shape, not everywhere deeper than wide, but the reverse posteriorly; anal much shorter and lower, no teeth on jaws, and the spines on preorbital ridge better developed and different in shape.

(*veternus*, an old man, veteran, in allusion to the want of teeth.)

10. SARRITOR Cramer.

Sarritor CRAMER, in Jordan and Evermann, Check-List Fishes, 1896, p. 448 (*frenatus*).

Body tapering uniformly to base of caudal; head 4 to 4½, depth 6 to 8 in standard length. Plates on body nearly all without spines. Plates in dorsal series 38 to 45, 5 to 6 pairs between occiput and first dorsal. No large knife-like plate over eye. Both dorsal fins present, rather long, the rays growing shorter behind the last adnate to back. Four to 6 pairs of barbels about mouth, 1 pair under tip of snout. A pair of recurved spines near tip of snout. One pair of supraocular and 1 or 2 pairs of occipital spines. Teeth on jaws and vomer, none on palatines. Gill membranes joined to isthmus, without free fold; no barbels on gill membranes. Lower rays of pectorals with free exserted tips. Vertebræ, 40 to 46. This genus is very close both to *Podothecus* and to *Odontopyxis*, differing from the former in the presence of vomerine teeth and from the latter in the absence of a free median plate at the tip of the snout. Its relations to *Averruncus* are still closer, the chief difference being in the smooth plates of the body and in the absence of cirri on the gill membranes.

(*sarritor*, one that scrapes.)

a. Snout moderate, about half length of head; ventrals dark in male.... *frenatus*, 19.

aa. Snout very long, produced in a flat, triangular piece, exserted for two-thirds length of orbit; ventrals pale..... *leptorhynchus*, 20.

19. SARRITOR FRENATUS (Gilbert).

Odontopyxis frenatus GILBERT, Rept. U. S. Fish. Comm., 1893, p. 437 (1896); north of Peninsula of Alaska, type 48727, U.S.N.M.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2078; same specimens.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898, p. 474; Povorotnaya, Kamchatka.—SCHMIDT, Faune Mer Japon, 1903, p. 16; Japan Sea.

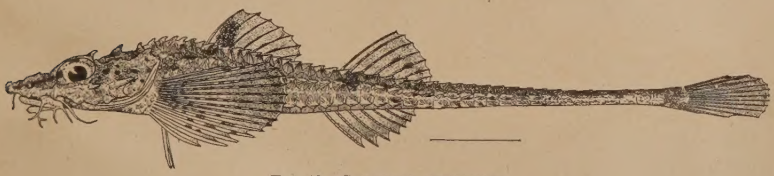

FIG. 13.—SARRITOR FRENATUS.

This species, fully described in the work of Jordan and Evermann, is recorded by Schmidt from Vladivostok.

(*frenatus*, bridled.)

20. SARRITOR LEPTORHYNCHUS (Gilbert).

Odontopyxis leptorhynchus GILBERT, Rept. U. S. Fish Comm., 1893 (1896), p. 437; Bering Sea, north of Alaska Peninsula, at Albatross Station 3267, lat. 55° 23′ 30″ N., long. 163° 29′ W. (Type No. 48727. Coll. *Albatross*.)

Sarritor leptorhynchus JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2073; about the Peninsula of Alaska.—SCHMIDT, Faune Mer Japon, 1903, p. 16; Japan Sea.

This species, otherwise known from north and south of the Alaskan peninsula, is recorded off Cape Pestschnuzoff, Korea, by Peter Schmidt. It is described in the work of Jordan and Evermann.

(λεπτός, slender; ῥύγχος, snout.)

11. ASPIDOPHOROIDES Lacépède.

Aspidophoroides LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 228 (*tranquebar-monopterygius*).

Canthirhyncus SWAINSON, Nat. Hist. Fishes, etc., II, 1839, p. 272 (*monopterygius*).

Body and head very slender; head 4 to 6, width 5 to 8 in length of body; 8 longitudinal rows of plates, the lateral line in upper lateral row; about 40 plates in the dorsal series. Terminal rostral plate present, unarmed; snout with hooked spines directed upward; mouth terminal; teeth on jaws, vomer, and palatines. Supraocular and occipital spines absent; plates of body more or less keeled, without spines. First dorsal absent; second dorsal and anal small, opposite each other, each with 4 to 7 rays. Gill membranes united, narrowly joined to isthmus anteriorly, free behind.

(ἀσπίς, shield; φορέω, to bear; εἶδος, form.)

21. ASPIDOPHOROIDES BARTONI Gilbert.

Aspidophoroides bartoni GILBERT, Rept. U. S. Fish Comm., 1893 (1896), p. 434; Aleutian Islands, Bristol Bay, Alaska (Coll. *Albatross*).—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2092; Aleutian Islands, Bristol Bay, Pribilof Islands.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898, p. 475; Pribilof Islands, Unalaska, Medni Island.

Aleutian Islands; taken very abundantly both north and south of the Aleutian Islands and in Bristol Bay, at depths of 17 to 121 fathoms. Also found about the Pribilof Islands. A specimen from Kayabe Island off Hokkaido is in the Imperial Museum of Tokyo.

(Named for Mr. Barton A. Bean.)

12. ANOPLAGONUS Gill.

Anoplagonus GILL, Proc. Acad. Nat. Sci. Phil., 1861, p. 259 (*inermis*).

This genus differs from *Aspidophoroides* in the absence of nasal spines.

(ἄνοπλος, unarmed; *Agonus*.)

22. ANOPLAGONUS INERMIS Günther.

Aspidophoroides inermis GÜNTHER, Cat., II, 1860, p. 524; Vancouver Island.—LÜTKEN, Ulkefiske, Vidensk. Meddel. Naturhist. Foren. Kjöb., 1876, p. 385.—JORDAN and GILBERT, Synopsis, 1883, p. 725.—JORDAN, Cat. Fishes N. A., 1885, p. 113.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2093; Vancouver Island, Bristol Bay, Aleutian Islands.—SCHMIDT, Faune Mer Japon, 1903, p. 16; Japan Sea.

Anoplagonus inermis GILL, Proc. Ac. Nat. Sci. Phila., XIII, 1861, p. 167.

Coast of Alaska, south to Vancover Island; not abundant; recorded from Vancouver Island (Günther); eastern Aleutian Islands, 34 to 59 fathoms, and Bristol Bay. (Gilbert.) Specimens were taken by Peter Schmidt off Cape Pestschnuzoff, Korea.

(*inermis*, unarmed.)

SUMMARY.

Family AGONIDÆ.

1. *Tilesina* Schmidt.

1. *gibbosa* Schmidt.

2. *Percis* Scopoli.

2. *japonica* (Pallas).

3. *Agonomalus* Guichenot.

3. *proboscidalis* (Valenciennes); Hakodate.
4. *jordani* Schmidt; Shiraoi; Hakodate.

4. *Hypsagonus* Gill.

5. *quadricornis* (Cuvier and Valenciennes)

5. *Occa* Jordan and Evermann.

6. *dodecaedron* (Tilesius); Iturup Island.
7. *iburia* Jordan and Starks; Tomakomaki.

6. *Brachyopsis* Gill.

8. *rostratus* (Tilesius); Iturup Island, Hakodate.
9. *segaliensis* (Tilesius).

7. *Pallasina* Cramer.

10. *barbata* (Steindachner); Nemuro, Aomori, Mororan.

8. *Draciscus* Jordan and Snyder.

11. *sachi* Jordan and Snyder; Kayabe, Aomori.

9. *Podothecus* Gill.

12. *tokubire* Ishikawa.
13. *accipiter* Jordan and Starks; Robben Island.
14. *sturioides* (Guichenot).
15. *hamlini* Jordan and Gilbert; Iturup Island, Kayabe.
16. *gilberti* (Collett).
17. *thompsoni* Jordan and Gilbert; Iturup Island.
18. *veternus* Jordan and Starks; Robben Island.

10. *Sarritor* Cramer.

19. *frenatus* (Gilbert).
20. *leptorhynchus* (Gilbert).

11. *Aspidophoroides* Lacépède.

21. *bartoni* Gilbert; Kayabe.

12. *Anoplagonus* Gill.

22. *inermis* Günther.